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PLUTONIUM GAMMA-RAY MEASUREMENTS FOR MUTUAL RECIPROCAL INSPECTIONS OF DISMANTLED WEAPONS

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In the O'Leary-Mikhailov agreement in March 1994, it was agreed that the United States and Russia would engage in mutual reciprocal inspections (MRI) of fissile material removed from dismantled nuclear weapons. It was decided to begin with MRI of plutonium removed from dismantled weapons and held in storage containers. It was agreed that Pu/MRI will determine that the material in the containers have properties consistent with a nuclear weapon component. One of these properties is that the  $^{240}\text{Pu}/^{239}\text{Pu}$  ratio be consistent with weapons-grade material. One of the technologies chosen for Pu/MRI is to use a narrow region (630-670 keV) of the plutonium gamma-ray spectrum, taken with a high-purity germanium detector, to verify that it is weapons-grade plutonium and determine the minimum mass necessary to produce the observed gamma-ray intensity. In November 1994, U.S. and Russian scientists met at the Lawrence Livermore National Laboratory for joint experiments on Pu/MRI. Gamma-ray measurements were made on three unclassified weapons-grade plutonium standards and one reactor-grade standard (21%  $^{240}\text{Pu}$ ). The gamma-ray measurements were able to determine the  $^{240}\text{Pu}/^{239}\text{Pu}$  ratio of these standards to accuracies within 10%. The minimum mass estimates varied, as expected, directly with the exposed surface area of the standard.

ORAL PRESENTATION

Topic: Nonproliferation and Arms Control — Transparency and verification technology

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